

Recovery Plan Action Status**Plan Name: Bluemask (=Jewel) Darter (Etheostoma (Doration) sp.) Recovery Plan****Plan Status: Final****Plan Date: 25-Jul-97****Lead Agency: USFWS****Lead Office: Tennessee Ecological Services Field Office****(951)
528-6481)**

Species	Action Priority #	Action #	Action Description	Action Status	Est. Initiation Date	Est. Completion Date	Responsible Parties	Work Type	Labor Type	Action Comments
Bluemask (=jewel) Darter (Etheostoma sp.)	1	1	Continue to utilize existing legislation and regulations to protect species and its habitat	Ongoing Current	FY 1995 - FY 1999		U.S. Fish and Wildlife Service, Ecological Services Division, U.S. Fish and Wildlife Service, Law Enforcement Division, Other Federal Agencies, State Conservation Agencies, USFWS Regional Office 4	Other: Regulations	Internal Field Assistance	For all tasks with Responsible Parties: SCA - Includes the Tennessee Wildlife Resources Agency and the Tennessee Department of Environment and Conservation; FA - Includes the U.S. Army Corps of Engineers, U.S. Environmental Protection Agency, and U.S. Natural Resources Conservation Service.

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Bluemask (=jewel) Darter (Etheostoma sp.)	2	10	Develop and implement a monitoring program	Ongoing Current	FY 2008		U.S. Fish and Wildlife Service, Ecological Services Division, The Nature Conservancy, Other Federal Agencies, State Conservation Agencies, USFWS Regional Office 4	Management: Population Monitoring, Research: Population Assessment, Research: Population Surveys	Internal Field Assistance	The Tennessee Valley Authority (TVA) initiated a program to monitor the bluemask darter in 2008; this program provides a baseline for measuring future trends. TVA has confirmed species presence at locations in the Collins River (Warren and Grundy counties, TN), upper Caney Fork River (White County, TN) , Rocky River (Van Buren County, TN), and Cane Creek (Van Buren County, TN). They have also documented lack of the species in the Calfkiller River (White County, TN), where a population occurred historically. Populations will continue to be monitored every two to three years in these systems.

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Bluemask (=jewel) Darter (Etheostoma sp.)	3	11	Annually assess recovery program and modify program and plan where required	Ongoing Current	FY 1995 - FY 1999		U.S. Fish and Wildlife Service, Ecological Services Division, The Nature Conservancy, Other Federal Agencies, State Conservation Agencies, USFWS Regional Office 4	Management: Planning, Research: Demographic Studies, Research: Ecosystem Studies, Research: Environmental Contaminants, Research: Genetics, Research: Habitat Status, Research: Population Assessment, Research: Reintroduction	Internal Field Assistance	<p>Tennessee Valley Authority (TVA) conducted an Index of Biological Integrity (IBI) Survey on the Calfkiller River in White County, TN in 2010. Sampling confirmed that the species is extirpated in the Calfkiller River. Water quality sampling and benthic macroinvertebrate community sampling in the Calfkiller River indicated relatively healthy ecological conditions in this system. Habitat surveys determined that sufficient suitable habitat is available to bluemask darters. TVA and the FWS will coordinate to collect genetic materials from known populations of bluemask darters in fall of 2011, and analyze the genetic structure of these populations along with demographic and life history data in late FY 2011 and/or early 2012.</p> <p>If it determined that the Collins River population is demographically stable enough to provide a source from which to translocate individuals (likely only existing population large enough to serve as a source), introductions might be attempted in the Calfkiller River, as an alternative to</p>

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										establishing a captive propagation program. However, population genetics data must first be sufficient for evaluating the distribution of genetic variation among individual populations of bluemark darters. If it is determined that existing populations can not function as a source of individuals for introduction into the Calfkiller River, a captive propagation program may be considered. The recovery program for this species will continue to be adjusted, as needed, based on the results of surveys and research studies.
Bluemask (=jewel) Darter (Etheostoma sp.)	1	2	Solicit help in the protection and conservation of the species and its habitat	Ongoing Current	FY 1995 - FY 1999		U.S. Fish and Wildlife Service, Ecological Services Division, The Nature Conservancy, Other Federal Agencies, State Conservation Agencies, USFWS Regional Office 4	Other: Information and Education	Internal Field Assistance	
Bluemask (=jewel) Darter (Etheostoma sp.)	1	3	Develop programs like "Partners for Wildlife" with willing landowners to protect and improve habitat quality	Ongoing Current	FY 2000 - FY 2004		U.S. Fish and Wildlife Service, Ecological Services Division, The Nature Conservancy, Other Federal Agencies, State Conservation Agencies, USFWS Regional Office 4	Management: Habitat Maintenance and Manipulation	Internal Field Assistance	

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Bluemask (=jewel) Darter (Etheostoma sp.)	1	4	Develop information and education program and present	Not Started			U.S. Fish and Wildlife Service, Ecological Services Division, The Nature Conservancy, Other Federal Agencies, State Conservation Agencies, USFWS Regional Office 4	Other: Information and Education	Internal Field Assistance	Task duration: 1 year then continuous

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Bluemask (=jewel) Darter (Etheostoma sp.)	1	5	Conduct research necessary for species' management and recovery; i.e., habitat requirements, biology, and threat analysis	Ongoing Current	FY 2000 - FY 2004		U.S. Fish and Wildlife Service, Ecological Services Division, The Nature Conservancy, Other Federal Agencies, State Conservation Agencies, USFWS Regional Office 4	Research: Demographic Studies, Research: Genetics, Research: Habitat Requirements, Research: Population Assessment, Research: Reintroduction	Contract, Graduate Student, Internal Administrative, Internal Field Assistance, Internal Technical Assistance	<p>Simmons et al. (2008) studied age-class structure and variability of two populations (Rocky River and Collins River) of the bluemask darter.</p> <p>Simmons and Layzer (2004) studied spawning behavior and spawning microhabitat in the Collins River population from May 29 through July 1, 2002.</p> <p>Layzer and Brady (2002) determined bluemask darter microhabitat usage during June - September 2000.</p> <p>Smith (2005) studied the population genetics of bluemask darters using microsatellites to determine the level of gene flow among seemingly isolated populations, and to determine the amount of inbreeding within populations.</p> <p>Layman, Simons and Wood (1993), Simmons and Layzer (2004), and Simmons (2004) determined potential and actual threats to the bluemask darter.</p> <p>TVA and FWS will conduct a bluemask darter genetic study in late FY 2011 and/or 2012. This study will: 1) describe the genetic diversity of the bluemask</p>

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										darter in and among sampling localities presumed to represent populations, 2) delineate these putative populations into conservation units that show significant differences, 3) determine if differences are biologically relevant, 4) estimate effective population size and compare to known bench marks, 5) estimate census size of units, and 6) perform a population viability analysis of each unit. (Some genetic materials from the Caney Fork River have already been accessed as part of this above study).
Bluemask (=jewel) Darter (Etheostoma sp.)	1	6	Based on biological and threat analyses, investigate need for management and implement where needed	Not Started			U.S. Fish and Wildlife Service, Ecological Services Division, The Nature Conservancy, Other Federal Agencies, State Conservation Agencies, USFWS Regional Office 4	Work type not yet selected	Labor type not yet selected	

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Bluemask (=jewel) Darter (Etheostoma sp.)	1	7	Determine number of individuals required to maintain viable population	Ongoing Current			U.S. Fish and Wildlife Service, Ecological Services Division, The Nature Conservancy, Other Federal Agencies, State Conservation Agencies, USFWS Regional Office 4	Research: Demographic Studies, Research: Genetics, Research: Population Assessment, Research: Population Surveys	Internal Administrative, Internal Field Assistance, Internal Technical Assistance	The Tennessee Valley Authority (TVA) and FWS will conduct a genetics study of known bluemask darter populations in late FY 2011 and/or FY 2012. Part of this study will entail estimating effective population size and compare those to known benchmarks, estimating census size of conservation units (individual populations), and performing a population viability analysis of each unit.

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Bluemask (=jewel) Darter (Etheostoma sp.)	2	8	Search for additional populations and suitable habitat	Complete	FY 2000 - FY 2004		U.S. Fish and Wildlife Service, Ecological Services Division, The Nature Conservancy, Other Federal Agencies, State Conservation Agencies, USFWS Regional Office 4	Research: Population Surveys	Internal Field Assistance, Species Expert	<p>Tennessee Valley Authority (TVA) conducted an Index of Biological Integrity (IBI) Survey on the Calfkiller River in White County, TN in 2010. Sampling confirmed that bluemask darters are extirpated in the Calfkiller River.</p> <p>TVA assessed portions of the Calfkiller River for suitable bluemask darter habitat to allow for potential reintroductions during the summer of 2009. They found that suitable physical habitat existed in many reaches. These findings were similar to surveys conducted in the past to determine whether adequate suitable bluemask darter habitat existed in the Calfkiller River (Simmons 2004; Layman 1991).</p>

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Bluemask (=jewel) Darter (Etheostoma sp.)	2	9	Develop techniques, select sites, reintroduce the species back into historic habitat, and evaluate and protect any populations established	Ongoing Current	FY 2008		U.S. Fish and Wildlife Service, Ecological Services Division, The Nature Conservancy, Other Federal Agencies, State Conservation Agencies, USFWS Regional Office 4	Research: Demographic Studies, Research: Ecosystem Studies, Research: Environmental Contaminants, Research: Genetics, Research: Habitat Status, Research: Population Assessment, Research: Population Surveys, Research: Propagation, Research: Reintroduction	Contract, Internal Administrative, Internal Field Assistance, Internal Technical Assistance	<p>The Tennessee Valley Authority (TVA) assessed portions of the Calfkiller River (White County, TN) for suitable bluemask darter habitat to allow for potential reintroductions during the summer of 2009. They found that suitable physical habitat existed in many reaches. These findings were similar to surveys conducted in the past to determine whether adequate suitable bluemask darter habitat existed in the Calfkiller River (Simmons 2004; Layman 1991).</p> <p>TVA conducted an Index of Biological Integrity (IBI) Survey on the Calfkiller River in 2010. Sampling confirmed that the species is extirpated in the Calfkiller River. Water quality sampling and benthic macroinvertebrate community sampling in the Calfkiller River indicated relatively healthy ecological conditions in this system.</p> <p>TVA and the FWS will coordinate to collect genetic materials from known populations of bluemask darters, and analyze the genetic structure of these populations along</p>

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										<p>with demographic and life history data in late FY 2011 and/or 2012. Some analysis of genetic materials from the Caney Fork system has already occurred.</p> <p>If it determined that the Collins River population is demographically stable enough to provide a source from which to translocate individuals (likely only existing population large enough to serve as a source), introductions might be attempted in the Calfkiller River, as an alternative to establishing a captive propagation program. However, population genetics data must first be sufficient for evaluating the distribution of genetic variation among individual populations of bluemask darters. If it is determined that existing populations can not function as a source of individuals for introduction into the Calfkiller River, a captive propagation program may be considered. Before any reintroduction attempts are made, additional investigations into why the species became extinct in the Calfkiller River are warranted to ensure that a population can be adequately</p>

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										reestablished without falling into a similar fate.